REMARKS

The present application was filed on December 22, 2003. The present amendment amends claims 1, 3, 12, 13, 15-17, and 32. Applicant performed a minor amendment to the specification to correct an error of a grammatical nature.

With regard to claims 1, 3, and 32, Applicant has modified these claims in order to make it clear that processing includes at least partially removing an effect of a transmit filter, a receive filter, or both a transmit filter and a receive filter on the multi-path profile. These claim amendments are supported, e.g., by claim 10 and by page 10, lines 1-5.

In the outstanding Office Action, the Examiner (1) objected to the drawings, (2) rejected claims 6, 12, 13, 15-17, 19, 28 under 35 U.S.C. §112, second paragraph, (3) rejected claims 1-3, 8 and 9 under 35 U.S.C. §103(a) as being unpatentable over Admitted Prior Art in view of Golovin et al., U.S. Patent No. 6,177,907, (4) rejected claims 10-16, 21-25, 30, and 31 under 35 U.S.C. 103(a) as being unpatentable over Admitted Prior Art in view of Golovin et al., (5) allowed claim 33, (6) rejected claim 32 under 35 U.S.C. §103(a) as being unpatentable over Admitted Prior art in view of Golovin; (7) objected to claims 4, 5, 7, 26, 27, and 29 but indicated these claims would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims, and (8) indicated that claims 6, 17-20, and 28 would be allowable if rewritten to overcome the rejections under 35 U.S.C. §112, second paragraph, and to include all limitations of the base claim and any intervening claims.

With regard to (1) above, Applicant submits formal drawings contemporaneously herewith.

Regarding (2), the Examiner rejected claims 6, 12, 13, 15-17, 19, 28 under 35 U.S.C. §112, second paragraph. The Examiner rejected claims 6, 19, and 28, as these claims recite "further comprising adding a pre-whitening term to stabilize the inverse as $\mathbf{x}=(\mathbf{F}^{T} \cdot \mathbf{F} + \mathbf{epsilon} \cdot \mathbf{I})^{-1} \cdot \mathbf{F}^{T} \cdot \mathbf{y}$" and the Examiner stated that there was insufficient antecedent basis for the term "the inverse". Applicant respectfully disagrees. Claim 6, for instance, depends from claim 5. Claim 5 recites "where vector $\mathbf{x}$ is derived as $\mathbf{x}=(\mathbf{F}^{T} \cdot \mathbf{F})^{-1} \cdot \mathbf{F}^{T} \cdot \mathbf{y}$, where $\mathbf{T}$ denotes a

transpose operation and **-1** denotes an inverse matrix operation". The element "$(\mathbf{F}^T \cdot \mathbf{F})^{-1}$" is therefore an inverse. The inverse "$(\mathbf{F}^T \cdot \mathbf{F})^{-1}$" can be stabilized (as indicated in claim 6) as $(\mathbf{F}^T \cdot \mathbf{F} + \mathbf{epsilon} \cdot \mathbf{I})^{-1}$. The term "the inverse" in claim 6 therefore has antecedent basis based on the element "$(\mathbf{F}^T \cdot \mathbf{F})^{-1}$". The Examiner is also correct in that stabilization of the inverse is also stabilization of the inverse matrix operation (similarly, stabilization of the inverse matrix operation is stabilization of the inverse). Nonetheless, Applicant respectfully submits that claim 6 is correct as written. Because claim 6 is correct, claims 19 and 28, which contain similar subject matter and dependencies (e.g., claim 19 depends from claim 18) to claim 6, are also correct. Applicant requests the §112 rejection to claims 6, 19, and 28 be withdrawn. It is noted that Applicant submits a reference ("AVO and the General Inverse Theory") discussing a version of a least squares estimation using an equation (equation (3), page 74) similar to the equation shown in claims 6, 19, and 28.

Regarding claims 12 and 13, the Examiner asserted that "said transmitter" lacked antecedent basis. Applicant has amended claim 12 to recite "where said receiver is located at a mobile station, and where a transmitter comprising said transmitter filter is located at a base station" (emphasis added). Applicant has amended claim 13 to recite "where said receiver is located at a base station, and where a transmitter comprising said transmitter filter is located at a mobile station" (emphasis added). Applicant respectfully submits that amended claims 12 and 13 are free of defects and request the §112 rejection to these claims be withdrawn.

The Examiner rejected claims 15-17 as reciting the subject matter of "said deconvolution searcher", which the Examiner asserted lacked antecedent basis and recommended changing this subject matter to "said deconvolution searcher block". Applicant has amended claims 15-17 to incorporate the changes recommended by the Examiner and requests the §112 rejection to claims 15-17 be withdrawn.

Independent claims 12, 13, and 15-17, as now clarified by amendment, should be found to be free of rejection under 35 U.S.C. §112, second paragraph. These amendments are deemed to be cosmetic in nature, and thus was not made for a reason related to patentability, as the Examiner could have simply objected to these claims, and not rejected

them under 35 U.S.C. §112, second paragraph. In any event, this amendment should not be construed to impair in any way the application of the full range of equivalents for the claimed subject matter.

Regarding claims the rejections in (3), the Examiner rejected claims 1-3 and 8-9 under 35 U.S.C. §103(a) as being unpatentable over Admitted Prior Art in view of Golovin. Applicant respectfully disagrees.

The Examiner indicates that the "Admitted Prior Art" (Applicant in no way admits that the materials in the Background section of the specification are Admitted Prior Art) does not disclose "at least partially removing an effect of at least one of a transmit and a receive filter on the multi-path profile" in (unamended) independent claim 1. The Examiner cites Golovin for disclosing the subject matter of "at least partially removing an effect of at least one of a transmit and a receive filter on the multi-path profile" in (unamended) independent claim 1. See also the rejections of dependent claim 3 and independent claims 10 and 21. Applicant respectfully disagrees. Applicant respectfully submits that Golovin does not disclose the subject matter in amended independent claim 1 of "at least partially removing an effect of at least one of a transmit filter or a receive filter on the multi-path profile".

Golovin is directed to determining an angle-of-arrival (AOA) of a "prompt" ray at an adjacent sector of a base station. Golovin, Abstract. Although Golovin does not appear to define a "prompt" ray, it is believed the prompt ray is a "direct" array arriving from a transmitter, and other rays (including a "peak" ray) arrive after the prompt ray. A system including multiple arrival of rays at multiple antennas is shown in FIG. 1 of Golovin and described at col. 2, lines 44-59. Determination of the prompt ray is used for locating a remote unit transmitter. Golovin, col. 1, lines 32-36.

Golovin discloses a system in FIG. 2 where "The output of each of the searchers 205 and 207 is an estimated amplitude of the signal 117 arriving at the respective antennas. These estimates are fed to an AOA computer 209 from which the AD-AOA [amplitude-based angle-of-arrival] estimate is computed." Golovin, col. 3, lines 1-4. The estimated amplitude does not appear to "at least partially remov[e] an effect of at least one of

a transmit filter or a receive filter on the multi-path profile" as in claim 1. For instance, any effects of transmit or receive filters are still in the received signal, but the amplitude of the received signal has been determined using the received signal.

Golovin describes another system in FIG. 3 that determines a Power Delay Profile (PDP) in order to determine the AOA estimate:

> FIG. 3 illustrates a first modification to the location searcher shown in FIG. 2 and described above. The main sector location searcher 301 and the adjacent sector location searcher 302 work in two phases. The signals received from the main sector antennas 103/105 and the adjacent sector antennas 107/109 are despread 303,305 and coherently averaged 307,309 over N_1 and N_2 Walsh symbols, respectively. An estimate of the maximum Doppler frequency is used to determine appropriate values for the coherent averaging window N_{opt1} and N_{opt2}, respectively, which are used for coherent averaging. In a second stage, the signals are respectively non-coherently averaged 311, 313 over M_1 and M_2 averaging periods, respectively. These procedures are done for several time offsets of the dispreading [sic] PN sequences separated by one eighth of a chip period to build ***a power delay profile (PDP)*** with the results being retain [sic] in a memory (not depicted).
>
> From the memory, the time-delay estimators 315 and 317 and amplitude estimators 319 and 321 select the maximum of the PDPs and assign the time offset and square root values of these offsets to the time of arrival (T_1 and T_2) and signal amplitude (A_1 and A_2) estimates, respectively. The estimates are then fed to the AOA computer 323, which forms the ratio A_1/A_2 and the AOA estimate $\phi = S_o (A_1/A_2)$.

Golovin, col. 4, lines 5-28. The PDP appears to be a profile of how power changes over time and, consequently, the PDP does not appear to "at least partially remov[e] an effect of at least one of a transmit filter or a receive filter on the multi-path profile" as in claim 1.

The Examiner appears to cite the searchers 401, 501 in FIG. 4 and 5 of Golovin, respectively, and in particular the "pulse shape deconvolution" element 403 of Golovin for disclosing this subject matter. While the pulse shape deconvolver 403 in FIGS. 4 and 5 of Golovin does have an input of a "PDP window set", the PDP window in Golovin appears to set a window around a peak that corresponds to the "prompt ray" (i.e., the first arriving ray and not an echo) in order to determine the time delay and amplitude of the prompt ray. See Golovin, col. 4, lines 29-33, where there is a discussion of the inability of

the system of FIG. 3 to resolve the prompt ray. See also Golovin, col. 4, lines 34-59, where FIG. 4 is described as having the ability to resolve the prompt ray but not resolve the peak ray (i.e., an echo of the prompt ray).

Golovin also states the following:

> The location searcher 401 produces a PDP using the technique described above with respect to FIG. 3. Using this PDP a new window is formed around its peak (i.e., Wc=2Tc). The received signal from the main sector antennas 103/105 is despread for the time offset in the window Wc and then integrated coherently 307, deconvolved 403 with the known pulse shape and non-coherently integrated 311. The deconvolution 403 is carried out after the coherent integration process 307 where the SNR has been enhanced significantly (14-21 db for maximum Doppler frequency range from 80 Hz-100 Hz). Thus, location searcher 401 is able to resolve sub-chip spaced rays and achieve high precision estimation of the prompt ray time-delay T_1 and amplitude A_1.

Golovin, col. 4, lines 40-53. While the element 403 in Golovin is described as "deconvolved 403 with the known pulse shape", there is no indication in Golovin that the pulse shape or the window formed around the peak of the PDP is in any way associated with a transmit or receive filter. Consequently, the pulse shape deconvolution 403 does not appear to "at least partially remov[e] an effect of at least one of a transmit filter or a receive filter on the multi-path profile" as in claim 1.

The Examiner also makes the following argument:

> By using convolution the prior art is in fact applying a concept of matched filtering; i.e., applying [a] filter with an impulse response which is a time reversal version of the transmit filter which amounts to applicant's "removing an effect of at least one of a transmit and a receive filter on the multipath profile".

Outstanding Office Action, page 4, section 12, sentence on bottom of page. Applicant respectfully disagrees for at least the following reasons.

It is believed that a matched filter uses a receive filter that is designed to "match" the transmitted ***signal***. In other words, a matched filter has an impulse response h(t), where h(t)=s(T-t), and s(t) is the transmitted signal. The matched filter is related to the ***signal***

and not to a transmit filter. Therefore, even if a matched filter is being used in a receive filter, the receive filter would not necessarily remove an effect of a transmit filter (or a receive filter) on the multipath profile. In an enclosed Information disclosure statement, Applicant submits two references (Proakis and Lathi) discussing matched filters. Moreover, as described in Proakis, there would be N such matched filters, one for each of N basis functions that can be used to create transmitted signals. As can be determined using Proakis, the largest value from N such matched filters is selected as the optimum signal output. See FIGS. 5-1-7 and 5-1-9 and associated text. This process works because the response of the matched filter is a time-autocorrelation function of the transmitted signal. Proakis, page 239. Consequently, if a transmitted signal is not "matched" to a particular matched filter, there will be a less than optimal output from the particular matched filter. By contrast, when the transmitted signal and the matched filter are "matched", the output will be optimal and highest. The matched filter therefore is matched to the transmitted ***signal*** and a matched filter does not appear to remove an effect of a transmit or receive filter on a multi-path profile.

As neither the "Admitted Prior Art" nor Golovin discloses or implies "processing the received signal in the searcher to obtain a multi-path profile of the radio channel, where processing comprises at least partially removing an effect of at least one of a transmit filter or a receive filter on the multi-path profile" as recited in amended claim 1, the combination of the two does not disclose this subject matter. For at least these reasons, claim 1 is patentable over the combination of "Admitted Prior Art" and Golovin. Because claim 1 is patentable, its dependent claims 2, 3, 8, and 9 are also patentable for at least the reasons given with respect to claim 1.

With regard to the rejections in (3), the Examiner rejected claims 10-16, 21-25, 30, and 31 under 35 U.S.C. 103(a) as being unpatentable over Admitted Prior Art in view of Golovin. The Examiner admits that the Admitted Prior Art does not disclose "a unit for processing the received signal to at least partially remove an effect of at least said receiver filter on the multi-path profile" as in claim 10 but asserts that Golovin teaches a unit (403) for processing the received signal to at least partially remove an effect of at least said receiver filter on the multi-path profile.

However, Applicant has shown above that the pulse shape deconvolution block 403 appears to be entirely unrelated to a receiver filter. For instance, Applicant show above that there is no indication in Golovin that the pulse shape or the window formed around the peak of the PDP is in any way associated with a receive filter.

Therefore, neither "Admitted Prior Art" nor Golovin teach or imply "a unit for processing the received signal to at least partially remove an effect of at least said receiver filter on the multi-path profile" as recited in claim 10. Claim 21 also recites "a unit to at least partially remove an effect of at least said receiver filter on the multi-path profile" and the arguments given above are equally valid with respect to claim 21. Therefore, claims 10 and 21 are patentable over the cited materials, and their respective dependent claims 11-16, 22-25, 30, and 31 are also patentable for at least the reasons given above.

With regard to the rejections in (6), the Examiner rejected claim 32 under 35 U.S.C. §103(a) as being unpatentable over Admitted Prior art in view of Golovin. Applicant respectfully disagrees.

The Examiner asserts that "Applicant's Admitted Prior Art discloses ... where processing comprises passing the received CDMA signal through a filter selected to have a filter characteristic that approximates an inverted response of at least one of a base station transmit filter." Applicant respectfully requests the Examiner point out where the Applicant admits "where processing comprises passing the received CDMA signal through a filter selected to have a filter characteristic that approximates an inverted response of at least one of a base station transmit filter." Applicant cannot find any section of the present application, other than the "Summary" or the "Detailed Description" where a statement similar to "where processing comprises passing the received CDMA signal through a filter selected to have a filter characteristic that approximates an inverted response of at least one of a base station transmit filter" is made. See, e.g., Applicant's specification at page 3, lines 1-5; page 4, lines 2-5; and page 9, line 24 to page 10, line 7. Therefore, Applicant in no way admitted and does not presently admit the subject matter of "where processing comprises passing the received CDMA signal through a filter selected to have a filter characteristic that approximates an inverted response of at least one of a base station transmit filter" is admitted prior art.

Furthermore, Golovin does not disclose or imply "where processing comprises passing the received CDMA signal through a filter selected to have a filter characteristic that approximates an inverted response of at least one of a base station transmit filter" as recited in independent claim 32. Because neither Admitted Prior Art nor Golovin disclose this subject matter, the combination does not disclose this subject matter and claim 32 is patentable over the combination of Admitted Prior Art and Golovin.

In addition, the Examiner asserts that the Admitted Prior Art does not disclose a filter reducing an occurrence of multi-path sidelobes in the output data, but that Golovin does disclose a receive filter (element 403) used to reduce an occurrence of multi-path sidelobes (FIG. 7 [of Golovin]) in the output data. Applicant respectfully disagrees. The ***occurrence*** of sidelobes is not shown to be reduced in FIG. 7 of Golovin. Instead, the "sidelobe" (and Applicant does not admit that the peak ray in Golovin is a "sidelobe") shown in Golovin is a "peak ray", and the peak ray does not appear to be reduced by element 403 of Golovin. What Golovin appears to do is perform a certain sequence of operations, including deconvolution in element 403, in order to provide a graph as shown in FIG. 7, "deconvolution", so that the peak ray and prompt ray can be more accurately determined. See Golovin, col. 5, lines 15-43. There is, however, no indication in Golovin that the peak ray is in anyway reduced in occurrence.

Therefore, neither Admitted Prior Art nor Golovin teach or imply a "filter selected to have a filter characteristic that approximates an inverted response of at least one of a base station transmit filter or at least one mobile station receive filter so as to reduce an occurrence of multi-path sidelobes in the output data" as recited in independent claim 33. The combination of Admitted Prior Art and Golovin does not teach this subject matter, and independent claim 33 is therefore patentable over the combination of Admitted Prior Art and Golovin.

Based on the foregoing arguments, it should be apparent that claims 1-33 are thus allowable over the reference(s) cited by the Examiner, and the Examiner is respectfully requested to reconsider and remove the rejections. The Examiner is invited to call the undersigned attorney for any issues.

Respectfully submitted:

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